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Black Hills Mining Resources

Historic Context

Target Resource

Resources associated with precious metal and mineral exploitation in the Black Hills of South Dakota from 1874 to 1939.

Temporal Boundaries

The temporal parameters used to define historic mining activities in South Dakota coincide with documented EuroAmerican exploitation of precious metals and minerals in the Black Hills. Mining related activities began in 1874 and continue through present-day industrial developments. In recognition of the 50-year age standards for nomination to the National Register of Historic Places, the historic mining period in the Black Hills extends from 1874 through 1939, inclusive.

Spatial Boundaries

The spatial boundaries for the historic mining context in the Black Hills of western South Dakota. The Black Hills are a mountainous uplift surround by rolling plains encopassed within all or portions of Lawrence, Meade, Pennington, Custer, and Fall River Counties. The Black Hills provide the only geophysical setting for precious metals and minerals in South Dakota. Commodities exploited in this region include gold, silver, base metals, pegmatite products, petrochemicals [oil and gas], sand, gravel, and dimension stone, uranium, vanadium, tungsten, gypsum, industrial sand, molybdenum, rate-earth elements, thorium, and florine. Historically, the industrial focus of mining activities within South Dakota involved the exploitation of Black Hills precious metals [gold and silver] and pegmatites. Mining activities elsewhere in South Dakota include the exploitation of bentonite, sand, dimension stone, clay, gravel, and coal. Exploitation of these resources could be developed as areal sub-contexts within the mining industry of the state.

Conceptual Approach to the Historic Mining Context

This research is intended to develop objectives and goals for the management of historic mining activities in the Black Hills of South Dakota. The articulation of a historic mining resource context provides an organizational format to group information about historic mining activities based on themes, geographical limits, and chronological periods. The overall goal of this process is to coordinate identification activities and provide a framework and criteria for evaluating the significance of specific properties or property types. This process follows the Secretary of the Interior's Guidelines for Preservation Planning as part of South Dakota's Resource Protection and Planning efforts. Hardesty's (1988) discussion of preservation planning objectives served as a general model for structuring this context.

Based on these sources, the general approach utilized to develop this context involves the examination of existing historical documentary information as well as archaeological data. These sources are presented in the Selected Bibliography section of this report. Sources detailing general geological, mining, and engineering data are also presented.

Review of Historical Documentary Images of Black Hills Mining Resources

A review of the historical literature provides a broad image of the general patterns of development experienced by the mining industry and miners in the Black Hills. A brief discussion of these events is presented below. It should be noted that no comprehensive mining history of the Black Hills has been published. The absence of such a monograph and the paucity of primary sources is seen as a notable limitation in the development of an overview of the Black Hills mining experience.

The Black Hills of South Dakota and Wyoming embody the culmination of major gold rushes in the continental American West. With the confirmation of reported gold deposits in 1874, the Black Hills region benefited from the experiences and expertise of miners from gold fields in other regions of the country. The approximate dates of other major gold rushes include discoveries in California in the late 1840's; Oregon, Nevada, Arizona, and Colorado during the 1850's, Idaho and Montana in the 1860's (Kovats 1978). Production in the Black Hills continued to the place the region among the countries richest. The Homestake Mine in Lead represents the largest producing gold mine in North America.

Parker (1966) provides a comprehensive discussion of early reports of gold-bearing deposits within the Black Hills. These sources cite early traders and explorers who had traversed the area or discussed the potential with regional Native American groups. There is no archaeological or ethnographic evidence indicating regional Native American populations had developed

or exploited precious metals deposits in the Black Hills. Thus, the development of mining related activities in the Black Hills originates with EuroAmerican encroachment in the region.

Initial reports of gold-bearing deposits in the Black Hills were filed by the U.S. government expeditions led by Warren in 1857 and Raynolds in 1859 who circled the Black Hills but did not explore the interior of the region. Ferdinand Hayden, a prominent scientist who accompanied the Raynolds expedition was the first to announce the potential for gold deposits in the Black Hills (Hayden 1867 cited by McLaird and Turchen 1974). These rumors led to the authorization of a military and scientific expedition led by Lt. Col. Custer in 1874 to explore the interior of the Black Hills. Two professional miners and a cadre of scientists accompanied the expedition to assess the mineral wealth of the region. These miners, Ross and McKay, reported traces of placer gold along French Creek near the present-day community of Custer. Journalists (Krause and Olson 1974) accompanying the expedition published enthusiastic accounts the news of this discovery. These accounts led to a rapid influx of prospectors. By December of 1874, the Gordon Party had arrived in the Custer area from Sioux City and constructed a stockade for protection and initiated placer mining operations. Such intrusions were illegal under the terms of treaties between the Sioux and the U.S. Government.

The Gordon party and subsequent prospectors were expelled by military patrols. However, enforcement of this policy became increasingly difficult to sustain. By August of 1875, miners who had eluded the military patrols had organized the City of Custer, drawn town lots, and organized a mining district. The intense pressure to open the area up for mining activities led to the Black Hills Agreement with the Sioux to cede the Black Hills to the U.S. government in exchange for the establishment of reservations and other amenities.

Following the negotiation of the Black Hills Agreement in 1876, the Black Hills gold rush began in earnest. Initial mining activities consisted of placer mining in the Custer vicinity. Success in this area was limited and explorations in the northern Black Hills soon discovered rich placer deposits in the gulches of the Deadwood-Lead vicinity. Recovery processes utilized as part of the placer workings consisted of the familiar sluice, long tom, or rocker. Water rights and water delivery systems [ditches] were a valuable commodity in the recovery of placer deposits.

By late 1876, the Deadwood-area streamside placer deposits were claimed and the search for lode deposits began. Knowledgeable miners with experience in the California and Colorado gold fields were aware the placer gold originated from hardrock formations in the region. The geology of the Black Hills region supported two types of hardrock gold-bearing deposits; the cement ores, and the refractory ores.

The initial hardrock operations concentrated on the gold-bearing conglomerate of the eroded Precambrian age formation. This conglomerate consisted of waterworn pebbles and boulders of quartz and laminated quartzite. Between these pebbles were small grains of sand and mica. This conglomerate was cemented together with either pyrite or iron oxide (Waterland 1987) and became known as cement or conglomerate ores. Gold within the cement ores was largely free-milling, that is accessible for recovery by simply crushing the rock and employing a simple amalgamation process such as mercury-covered copper plates. The first gold mill in the Black Hills processed cement ores

utilizing an arrastra near the Chief of the Hills claim in Blacktail Gulch. This mill was operating in August of 1876. The heyday for working the cement ores lasted until the mid-1890's.

The relatively rich assay values and free-milling nature of the cement ores led to rapid construction of stamp mills. The stamp mill was developed in the California and refined in the gold fields of Nevada and Colorado prior to its introduction in the Black Hills. The stamp mills utilized steel stamps dropping onto battery assemblies to crush the ores in preparation for the recovery process. Jaw and gyrating crushers as well as Chilean mills were also incorporated in the crushing process. The mill machinery had to be transported to the area by bulltrain from railroad depots at Cheyenne and Sidney. These mills also represented an intensive capital investment and investors were eagerly sought during the establishment of mining companies. By early 1878, there were 31 mills with 535 stamps dropping in the Central City area and 14 mills with 215 in the Lead area with more under construction (Waterland 1987). Each mill was powered by a steam boiler and engine requiring large amounts of cordwood and constant supplies of water. Recovery rates averaged 40-60 percent of the available gold values. This recovery rate precluded the processing of low grade ores or an increase in the milling capacity to achieve economy of scale factors favorable to processing lower grade ore deposits.

The refractory hardrock ores associated with the Precambrian quartzites and porphories of the region presented a quite different challenge than the free-milling cement ores. The refractory ores, by definition contained gold values that were chemically bonded to the host rock and required the utilization of metallurgical techniques to recover the values. Exploitation of the refractory ores led to the construction of chlorination, pyritic smelting, and eventually cyanide mills to process these ores. Each of these recovery processes worked but the cyanide process introduced in the early 1900's proved to be a very cost-effective means of treating the refractory ores of the northern Black Hills. This method utilized a solution of potassium cyanide to leach the metallic values from the ore. This gold-bearing [pregnant] solution was then treated to recover the gold and silver values. Clow (n.d.) provides a comprehensive discussion of the various milling techniques utilized in the Black Hills. These processes achieved higher recovery rates and led to an expansion of mining activities in the various mining districts in the early 1900's. Those districts with extensive ore deposits such as the Ruby Basin, Bald Mountain, Keystone, and Galena districts experienced intensive activity following the consolidation of properties under the management of a dominant mining company. World War II led to the closure of the Bald Mountain and Homestake operations. Only Homestake resumed operation after the war, and continues its operation today. In some respects, the longevity of Homestake can be viewed as an unique expression of the history of hardrock mining in the Black Hills - since the history of this operation virtually mirrors the historical events and episodes of the entire region (i.e. Myron 1928; Cash 1973).

As the northern Black Hills [Deadwood-Lead] became the focus of mining activities in the Black Hills, a series of overland freight and stage routes were developed to accommodate the influx of prospectors and miners. These routes originated from railroad destinations at Cheyenne, Wyoming and Sidney, Nebraska. Overland routes were also developed from riverboats docks along the Missouri River at Ft. Pierre, South Dakota, and Bismarck, North Dakota.

Railroads began competing to serve the northern Black Hills gold fields in the 1880's. These railroads initially consisted of narrow gauge lines to haul ores from the mines to the mills, and firewood, equipment, supplies to the mining districts. The narrow gauge lines were supplanted by the arrival of the standard gauge lines linking the Black Hills to national rail systems (Mills 1985; Fielder 1985).

The population of the Black Hills increased dramatically as a direct result of mining activities. The EuroAmerican population in the area virtually erupted to encompass tens of thousands of people and hundreds of settlements (Parker and Lambert 1980) within a matter of months. Brief community and urban descriptions and personal recollections indicate a variety of ethnic and economic enclaves and intra-settlement organization (e.g. Klock 1975, 1986; Leedy 1961; Scott 1986a, 1986b; Finola 1981; Fielder 1978b; Buechler 1988 [Carbonate], 1988 [Terry]). The demographic profile of this population is thought to mirror other frontier expansions in the American West although this topic has not been directly examined in the Black Hills. Characteristics of the initial influx of prospectors are thought to have been comprised of young men. The first (1880) census of Deadwood indicated 29% of the population were miners, 16% percent were wives, 12% were laborers, with the remaining residents listing other occupations and children. The male to female ratio was 20:7 (Cassells et al. 1984).

Aspects of the ethnic affiliations are also poorly understood in the Black Hills region. The comparative presence of Chinese laborers was not as strong as the gold fields of California and Nevada. The 1900 Deadwood census listed 38 Blacks among its population. Jewish merchants, such as Sol Star, Harris Franklin, and Jake Goldberg operated successful business ventures. European immigrants dominated the ethnic groups contributing to the industrialization of the region. Cash (1973) discusses elements of the ethnicity expressed by Homestake employees in Lead prior to World War I. Italians, Serbs, Croats, Scandanavians, Cornish, Welsh, and Irish were among the largest ethnic groups in the region.

High-bank placer mining utilizing hydraulic extraction and recovery techniques such as monitors and extensive flumes as well as dredging emerged along major drainages from the late 1880's to the early 1900's. This industrial activity centered along Rapid, Castle, Spring, and Battle Creeks as well as the Rockerville vicinity of the central Black Hills. Few elements of the high bank or hydraulic placer mining have been extensively researched (e.g., Black Hills Engineer 1931; Anderson 1933; Connolly 1933; Buechler 1986 [Placerville]; c.f., LaLande 1985).

Similarly, little historical or archaeological attention has been paid to the pegmatite mining industry in the Black Hills. Pegmatite is the general name for acid igneous rocks of granitic character containing coarsely and unevenly crystallized and segregated minerals. Pegmatite deposits in the Black Hills occur as intrusive masses in veinlike or dikelike sheets, which for the most part, are the result of igneous offshoots of the Harney Peak batholith. Pegmatite deposits are found in the Custer vicinity of Custer County, and the Oreville and Keystone/Hayward vicinities of Pennington County. The one exception is a small local uplift centering around Nigger Hill in the Tinton vicinity of western Lawrence County.

The economic importance of pegmatites in the Black Hills is two-fold: the common (primary) minerals of pegmatite are found in exceptional size and purity, and they are a source of very rare (secondary) minerals. Over 100

minerals have been found to occur in the pegmatites of the Black Hills; however, less than 20 percent of this total have been commercially mined (South Dakota Planning Board 1937).

Mica (Muscovite) was the first pegmatite to be mined in Black Hills. Production was initiated at the Crown Mica Mine near Custer in 1879. Commercial exploitation of mica established a pattern for the pegmatite industry in the Black Hills - namely production would be sporadic and demand intermittent. Various minerals experienced demand cycles over the years. The Etta Mine near Keystone was noted for its large crystallization. World War II spurred the demand for many rare or strategic minerals and a government buying depot was established at Custer. Following the war, this depot was turned over to private control [now Pacer Corp.]. Casserite [tin] exploitation led to a boom in the Tinton region during the war. Little historical or technological research has centered on the extraction of pegmatite minerals in South Dakota.

Assessment of Documentary Sources

As indicated throughout the above review of documentary sources germane to historic mining activities in the Black Hills, there are three major categories of reference materials. One category consists of geological, engineering, and mine production data. Many of these are technical in nature and provide limited insight into cultural or social aspects of the target resource.

A second category consists of local or regional histories. The bulk of historical research in the region, although valuable, can be characterized as either superficial or limited in scope. There are also significant gaps in the focus of these investigations. Much attention has been extended to the northern Black Hills hardrock regions with little discussion of aspects of central and southern Hills hardrock, placer, or pegmatite mining. There is no standard monograph or treatise dealing with the mining history of the region. Likewise, social and cultural aspects of the Black Hills mining experience have been largely ignored.

A third category of documentary material consists research generated as the result of cultural resource management in the Black Hills, either Section 106 or State mining permit review. These sources are usually project specific and discussions are generally limited to the resources within the project boundaries. Recent exploration activities and surface mine developments in the Black Hills have prompted numerous research efforts in the 1980's. This research has contributed to an awareness of archaeological, technological, and cultural aspects of mining activities in the Black Hills through field inventory and mitigation work.

Despite the recent contributions made by cultural resource management data little systematic research has been conducted. These efforts have provided an image of the industrial components related to historic mining but little information regarding industrial auxiliary or social constituents. Limited thematic surveys (Historic American Engineering Record survey 1974-76; Black Hills Mining and Engineering survey in 1983) of selected sites as well

as county-wide surveys have been conducted by the State Historical Preservation Center. These research efforts have included mining and mining related resources.

Property Types

The definition of property types is intended to organize or structure individual properties based on shared physical or associative characteristics. These properties manifest the theoretical constructs presented in the examination of documentary evidence with physical target resources. The following property types are presented in outline format within general categories to facilitate future expansion of the data base and reflect the dynamic nature of the planning process.

1. Industrial Mining Activities

An industrial category includes a variety of property types directly associated with mining and milling activities. Each major type as well as variations of the constituent population are listed below:

Exploration Activities: Cultural resources associated with this property type consists primarily of ubiquitous surface features such as pits, trenches, and occasional adits. In general these features are devoid of artifactual remains. Isolated cabin ruins or dugouts can be found in association with these remains. Exploration activities can be found throughout the Black Hills. These remains are generally in poor physical condition and retain little physical integrity, thus; retain diminished archaeological imporatance. However, the historical importance of claim discoveries such as the Ross discovery claim near Custer, discovery claims # 1 & 2 in Deadwood Gulch, and John Perrett's [Potato Creek Johnny] claim along Potato Creek should be considered.

Placer Gold Mining Activities: This industrial property type consists of resources associated with the exploitation of placer gold deposits. These deposits are found in two geological contexts in the Black Hills: stream, and high level or highbank terrace deposits. The stream deposits consist of alluvial terraces along Tertiary/early Pleistocene drainages throughout the Black Hills. In most cases, these streams are ephemeral or provide limited flow rates. The highbank placer deposits are found along early Pleistocene terraces throughout the Black Hills. These deposits may be found forty to eighty feet or more above the present stream courses.

Mining techniques utilized to exploit either type of placer deposit could consist of trenches, shafts or drifts, and dry land dredges. Hydraulic placer mining techniques were utilized along major drainages offering reliable water flow rates in the central Black Hills. Hydraulic mining may include the use of dredges, extensive flume systems facilitating the use of monitors, and races in addition to trenches, shafts, and drifts.

A variety of processing technologies were employed to recover the gold from the placer deposits. Combinations of technological applications are likely at any placer deposit. In general, the "richer the strike,", the more elaborate the processing equipment. A list of possible equipment utilized at placer operations in the Black Hills is provided below:

A. Pan
B. Sluice
C. Long Tom
D. Rocker
E. Rubble Elevators
F. Screens
G. Magnetic Separators
H. Grizzlies
I. Trommels
J. Conveyors
K. Classifier
L. Jigs
M. Concentrator Tables

The inherent association of streams to stream placer deposits have contributed to the destruction of these resources through subsequent flooding. Thus the archaeological potential of stream placer mining is limited in most cases. Rubble and waste rock banks are the most common remaining features associated with these resources. The highbank placer mines of the central hills have the most potential for examining technological aspects of placer mining activities in the Black Hills.

Hardrock Precious Metal Mining Activities: This industrial property type consists of features or feature systems associated with the exploitation of hardrock, conglomerate or refractory ore, deposits throughout the Black Hills. The major mining districts are located in the northern Black Hills. Mining techniques include surface mines and glory holes as well as extensive underground workings. Underground techniques include drifting and stoping accessed by shafts and tunnels.

Surface features associated with mines may include the adit portal or shaft collar. Structural remains may include hoisting equipment or equipment platforms, headframes, boiler plant remains, structural remains or ruins, tram lines, ore bins, trails or roads, waste rock piles, and associated artifactual remains. Mines can frequently associated with mill complexes.

Preservation of these remains is quite variable. Much of the portable equipment was salvaged or recycled during periods of corporate consolidation or in response to scrap metal drives conducted during World War II. Open shafts have been filled and many of the tunnels have collapsed or been closed.

Industrial Mills/Processing Technologies: This industrial property type consists of mills constructed to recover the gold values from the ore. The mill design and technology utilized to accomplish this goal was dependent on the type of ore to be treated, and projected value of the ore reserves, and the technology available for processing the ore. In general, the milling process involves at least three stages: crushing, recovery, and disposal.

The crushing stage of milling involves crushing the ore and may include a combination of techniques in primary and secondary steps. The technologies utilized in the Black Hills include:

A. Grizzly
B. Arrastra
C. Stamp
    1. Wet
    2. Dry
D. Gyrator
E. Cone
F. Roll
G. Chilean
H. Tube

Following crushing, the recovery stage involved physical or metallurgical methods to retrieve the precious metals from the crushed ore. The techniques utilized in the Black Hills involved variations of four processes.

1. Amalgamation
2. Chlorination
3. Pyritic Smelter
4. Cyanide

Methods for the disposal of mill tailings ranged from simply dumping the materials outside the mill to the construction of impound structures such as brattices and tailings dams to control erosion.

There were hundreds of mills constructed in the Black Hills from the 1870's through the 1910's. The mills were built throughout the mining districts of the Black Hills with the greatest milling activity in the mining districts of the northern Black Hills. Most of these mills were constructed to process ores from a single mine or group of mines consolidated within a mining district. Only a few mills were constructed solely for custom processing. These custom plants were usually constructed along railroad sidings. Some small cyanide plants were constructed to process tailings from abandoned mills.

Similar to the mines, most mills are no longer standing. Many burned during operation and were not rebuilt. Others were salvaged for machinery or scrap. Some deteriorated into ruins or were torn down to avoid accidents. There are perhaps a dozen or less (other than Homestake) that remain in fair condition or better.

Pegmatite Mining Activities: This property type is usually consists of relatively small operations centered around an isolated geological mass. Mining usually consists of a surface mine or cut advanced with explosives. Broken rocks are then sorted, crushed, and hauled to market or shipping point. Activities associated with pegmatite exploitation appears to closely follow market trends with periods of inactivity. For example, Tinton experienced a boom period created by tin (casserite) production during World War II. Other minerals and strategic elements experienced similar boom and bust cycles.

Many aspects of pegmatite mining are poorly understood. This property type requires extensive historical and archaeological research to evaluate its significance to the region.

2. Auxiliary Industrial Activities

A second category of property types is composed of industrial activities that were augmented or supported the mining and milling activities. These industrial auxiliary property types are listed below. Many of these may overlap with existing contexts within the South Dakota State Preservation Plan.

Mining Related Transportation - Overland Routes: This property type is composed of overland routes and features associated with overland routes in the Black Hills. This property type could include stage and freight stops, campsites, or other features relating to these routes. These routes include both public or well-known trails as well as private toll roads. The precise locations of the routes or associated features is not well documented.

Mining Related Transportation - Railroads: This property type is composed of railroad grades and features associated with railroading in the Black Hills. Railroad service to the gold fields of the Black Hills represented the emergence of the region from the "frontier era" and linked the area to national and global markets.

Rail service in the Black Hills consisted of narrow gauge lines with served the mining districts, and standard gauge lines which linked the area to national rail services. Occasionally dual gauge tracks served both purposes. Features expected to be associated with railroads in the Black Hills include a number of facilities listed below:

1. Stations
2. Water Towers
3. Freight Stations
4. Section Houses
5. Roundhouses
6. Turntables
7. Engine Repair Shops
8. Yards
9. Sidings
10. Coaling Towers
11. Wyes
12. Interchanges

All narrow gauge lines serving the mining districts have been abandoned and salvaged. All the standard gauge lines have also been abandoned and are in various stages of salvage.

Mining Related Timber Activities: This property type consists of resources relating to logging and timber harvesting. The operation of the mines and mills required enormous amounts of lumber products for fuel and building materials. To supply these resources, mining companies and/or private contractors provided large-scale timber harvesting activities. Initially these activities were conducted near the mining districts. As the nearby supplies were depleted logging camps and communities were established along railroads to meet the demand. Little research has been conducted on this property type to adequately define the research potential. Several of these camps now serve as resort or recreational cabin areas (i.e., Nemo, Savoy, Woodville). Although the historic character of these former camps are recognized, the archaeological nature of the occupations have not been examined.

Mining Related Water Management: This property type consists of resources related to the management of water and water rights with respect to historic mining activities. This resource was a critical element in the development of individual property types. The formation and operation of private and corporate water delivery systems is poorly understood in the region. Aspects of water management may have factored heavily into decisions such as mill locations and design, underground workings, property consolidations, and inter-corporate relationships. Water management decisions also affected elements of community and urban development. Archaeological aspects of this property type may range from simple open ditches to elaborate flumes, tunnels, and pipes. Features of these systems may include dams, penstocks, trestles, and hydroelectric facilities. The engineering and design elements of these systems also require examination.

Lime and Limestone Production: This property type consists of resources related to the production of lime and limestone necessary for aspects of the milling process. It is known that railroad lines linked limestone quarries and kilns to the mining districts. However most aspects of the limestone industry are poorly understood.

Flux Mining: This property type consists of mining operations that produced pyritic flux for the operation of smelters in the early 1900's. The acquisition of this material was critical for the efficient operation of the smelting facilities. Sources of this material were obtained from gold mines that produced pyritic ores but low grade gold ore. Little is known about the critical role these mines played in the technological advancement of the milling process.

3. Settlement Components

A third category of property types relating to historic mining resources in Black Hills consists of settlement components. These components range from artifact scatters/dumps to isolated cabins or households to mining camps and communities including the establishment of urban centers. Processual elements of these property types are poorly understood in the region. Historical documentation has concentrated on community and urban development but has contributed little to the structure of mining camps or household organization. Archaeological investigations of these features has similarly overlooked these property types.

Artifact Scatters/Dumps/Privys: This property type consists of concentrations of artifacts or dumps that compose part of the archaeological record of the region. These features may have the potential to yield interpretative data regarding historic occupation of the region. Analyses of the materials can provide insights on aspects of subsistence, consumption patterns, demography, ethnic affiliation, material diffusion, technological change, and temporal parameters. Much of this information is commonly absent from historical accounts of settlement of the region.

Household Settlement: This property type can include resources ranging from isolated cabins to features within camps or urban communities. Components of this property type are located throughout the Black Hills. The physical conditions may range from standing structures to ruins to little surface images. Analyses of information inherent to these property types may contribute to aspects of architecture, economic status, demography, material consumption and production, ethnic affiliation, subsistence processes, and social structure.

Mining Camp Settlement: This property type consists of residential areas directly related to the operation of industrial mining and milling operations. In general these properties could be considered company towns in that the corporate sponsor directed the location and possibly the construction and layout (if any) of the features. The corporate sponsor may have also controlled provisions for essential services (i.e., stores, schools, water, etc.) and compositional structure of the residents (i.e., boarding houses for single men, single family dwellings, etc). Little research attention has examined the processual social aspects of these properties. Like the household, features within mining camps may contribute to an understanding of aspects of architecture, economic status, demography, material consumption and production, ethnic affiliation, subsistence processes, and social structure. Most constituents of this property type were abandoned shortly following closure of the mine or mill operation.

Community/Urban Settlement: This property type consists of towns and urban centers that were developed as a result of historic mining activities. The relationship between the population centers was heavily influenced by the mining industry. Historical aspects of the major communities, Deadwood, Lead, Terry, Galena are fairly well documented; however little attention has been devoted to smaller mining communities. Archaeological research has not been a

major factor in understanding social and material aspects of the mining communities.

Planning aspects of community/urban development are subsumed under the South Dakota Historic Preservation Plan. Subcontexts examining the relationship between mining activities and residential components should be considered.

Cemeteries: This property type can provide demographic data that can complement census records and historical accounts. Headstones may yield information regarding names, date of birth, date of death, nationality, and economic status. Analyses of skeletal remains can provide data regarding age, sex, mortality, morbidity, genetics, diet, and ethnic affiliation.

The Evaluation Phase

The evaluation phase is a vital link in the preservation planning process. The development of a historic context composed of property types is used to structure aspects of the inventory and identification process. The evaluation phase involves assessing the results of the inventory research by examining the significance of the resources within the historic context. The determination of significance is directed or influenced by the evaluation criteria. The delineation of evaluation criteria provides broad objective standards for determining the significance of a specific cultural property. In essence, these criteria provide a dynamic conceptual framework influencing resource management decisions.

Evaluation Criteria

The significance criteria for cultural properties under public domain is defined by federal law establishing eligibility requirements for nomination to the National Register of Historic Places (36 CFR 60.6; Part 800, Section 800.10). These criteria are as follows:

> "The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and
> (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or
> (b) That are associated with the lives of persons significant in our past; or
> (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master,

or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
(d) That have yielded, or may be likely to yield, information important in prehistory or history."

Evaluation of a cultural property under Criterion a examines its association with a historic event that is important locally, regionally, or nationally. Criterion b evaluates the association of a cultural property with a person who is important to local, region, or national history. Examination under Criterion c assesses a cultural property as a representative example of an important style or type. Criterion d examines whether a cultural property has the potential to provide information that can address important scholarly and scientific questions.

Criteria b and c are generally recognized as the domain of historians, engineers, and architects. In most cases, these associations are indicated by documentary or structural evidence. Criterion a and especially Criterion d are more frequently applied in considering the archaeological nature of historic mining sites. Hardesty (1988:109-111) provides an insightful discussion of how these criteria are applied to historic mining resources. He commends the present guidelines adopted by the South Dakota Historical Preservation Center (1985) for considering the "representativeness" of mining sites under the auspices of Criterion a. These guidelines raise questions relating to "rarity" - Is this site the first of its kind? Does the site represent a major technological advance? Is the site the "last of an era?" Does the site represent an innovative or experimental approach to mining? Aspects of integrity and completeness also factor into the HPC guidelines. Questions raised by the 1985 HPC guidelines involve a comparative aspect of evaluation. In order to assess the representativeness of a specific site, it is necessary to integrate that property into an existing data base of similar properties.

Hardesty (1988) also advocates the definition of questioning frameworks or research questions which address elements of Criterion d significance structured to include a range of scientific inquiry. This range could include site specific data as well as questions of regional and systemic importance. Hardesty (1988:116-117) then examines the site data against the research questions with the results ranked within an evaluation matrix. The matrix serves as a heuristic device to formalize the decision-making process. The value of this approach rests in explicit formalization and quantification of a variety of research questions. The presentation of the research questions used to evaluate a cultural property can themselves be examined by review agencies as well as scholars from other disciplines.

Research Questions Associated with Historic Mining Activities

This section seeks to develop a series of research questions germane to evaluating the significance of historic mining activities in the Black Hills of South Dakota. Many of these questions are of a general nature and can be applied to nearly all of the property types. Others are specific and can be used to establish comparative relevance. These questions are far from exhaustive, and are presented to guide rather direct or structure research at a specific site. Information answering these questions is considered important in the determination of site significance. Additional questions may be raised by the nature of a specific resource or with further refinement of research topics. The objective of these questions is to compile comparative data relating the nature of both historical and archaeological significance. As Hardesty (1988) indicated, the level of questioning can address regional, national and worldwide networks as part of an overall mining system.

1. Industrial Mining Activities

What are the dates of activity?

What historic mining district(s) is the resource located in? Is the claim on patented or unpatented property? Are mineral survey plats or records available?

Are the identities of the individuals or corporate entities known? Do these individuals or entities possess historical significance?

Are aspects of mining technology indicated by either documentary or archaeological evidence? Does the archaeological evidence contradict the documentary accounts? Can aspects of the mining or milling processes be reconstructed or interpreted based on the documentary or archaeological evidence? How does the technology employed fit within the overall development of industrial activities of the region?

Were there episodes of inactivity relieved by technological advances? Did this site contribute or have a role in the technological innovation?

What factors or decisions led to abandonment or closure of the site? For example; depleted placer or ore deposits, low-grade ore, water in the shafts, fire, corporate consolidation, lack of capital, over-extended finances, collapse of market commodity prices, major obstacles in economical operation, technological innovation or advances, political factors, legal disputes, other.

Are production records available? Was the site a major producer?

Is architectural or engineering information present?

What is the physical condition of the resource? How does the integrity of a particular site compare with similar properties? Does a resource possess rare or unique qualities?

What cultural or non-cultural transformations contributed or otherwise affected archaeological site formation processes? For example; flooding, fires, relic collecting or vandalism, corporate or individual recycling of equipment or material, salvage operations or scrap metal drives.

Are the remains associated with auxiliary industrial or settlement components? What is the relationship between the industrial features and these components? Were these components tendered by the operator or supplied by independent sources?

2. Auxiliary Industrial Activities

What are the dates of operation?

Are the identities of the individuals or corporate entities known? Do these individuals or entities possess historical significance?

What is the relationship with primary industrial complexes? Were the auxiliary activities directly supplied the primary industrial operator or supplied by independent sources?

How is the property represented in the documentary literature?

What is the physical condition of the resource?

Did this site contribute or have a role in the technological innovation?

Is architectural or engineering information present?

Did these auxiliary industries "mature" to operate independent of the mining industry?

What factors led to the abandonment or closure of auxiliary industry or activity?

Are settlement components associated with the auxiliary activities? What is the nature of these components?

What cultural or non-cultural transformations contributed or otherwise affected archaeological site formation processes?

Does a resource possess rare or unique qualities? What elements of the property could be considered "redundant."

3. Settlement Components

What was the date or dates of occupation?

What factors contributed to the abandonment or growth of the property?

Is the property associated with individuals or organizations of historical importance?

How is the property represented in the documentary literature? How would this property contribute to the regional historical record? Is ethnic or demographic data available?

Does the property provide information regarding architectural style or construction technique?

What factors "structured" a settlement component? For example: company town, ethnic affiliation, topography, economic status, demographics, property ownership. Are these factors reflected in artifact distributions?

What artifact assemblages are available for analysis? How would these assemblages contribute to the development of a regional comparative data base? For example: subsistence, consumption or production patterns, economic status, technological changes, material diffusion, ethnic affiliation.

Are settlement components associated with industrial or auxiliary industries? What is the relationship between the feature systems?

What cultural or non-cultural transformations contributed or otherwise affected archaeological site formation processes?

Does a resource possess rare or unique qualities? What elements of a property are "redundant" and what would be considered unique? Which elements have the potential to yield significant information?

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Corporate offices of the major Black Hills mining companies (especially Homestake Mining Company in Lead) also have a variety of records relating to operation of historic properties. The Black Hills National Forest and the Bureau of Land Management have conducted numerous inventory surveys relating to its resource management activities. Many of these reports detail historic mining resources.

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CRITERIA
for the
EVALUATION OF HISTORIC MINING SITES

Property Types
(From Jeff Buechler, Black Hills Mining Resources Historic Context, Vermillion: State Historical Preservation Center, 1989)

1. Industrial Mining Activity Sites

   a. Exploration Sites

   b. Placer Mining Sites, includes such features and artifacts as: pans, sluices, long toms, rockers, rubble elevators, screens, magnetic separators, grizzlies, trommels, conveyors, classifiers, jigs, and concentrator tables

   c. Hardrock Mining Activity Sites, includes such features as: adit portal, shaft collar, hoisting equipment, equipment platforms, headframes, boiler plant remains, structural remains or ruins, tramway lines, ore bins, trails or roads, waste rock piles, and associated artifactual remains. Also frequently found with milling sites.

   d. Industrial Mills/Processing Technology Sites, includes such features as: grizzlies, arrastras, stamps (wet and dry), gyrators, cones, rolls, Chilean mills, tube mills, tailings and industrial structures, remains, and foundations or pads

   e. Pegmatite Mining Activity Sites, includes features such as: surface mine or open cut, equipment

2. Auxiliary Industrial Activity Sites

   a. Mining-related Transportation

      1) Stage
      2) Railroad

   b. Mining-related Timber Activities

      1) Logging camps
      2) Sawmills

   c. Mining-related Water Management Sites, includes features such as water company offices, ditches, flumes, tunnels, pipes, dams, penstocks,

trestles and hydroelectric facilities

d. Lime and Limestone Production Sites, includes such features as quarries and kilns

e. Flux Mining Sites

3. Settlement Component Sites

a. Scatter Dump or Privy Sites

b. Household Settlement Sites

c. Mining Camp Settlement Sites

d. Community and Urban Settlement Sites

e. Cemeteries

Evaluation Criteria

1. Broad Patterns of History. Sites which maintain sufficient buildings, structures, remains/ruins, features, artifactual material and geographical/ landscape patterns to interpret the specific era, activity themes, and historic life styles are eligible for listing. The eras, themes and life styles are the following:

a. 1876-1895 Pre-Cyanide Era, including Chlorination and Bromide Processing
   1) Extraction and Processing Sites, including exploration, placer mining, hydraulic mining and hard rock mining
   2) Transportation Sites, including railroad and stage
   3) Timber Sites, including sawmills and lumber camps
   4) Settlement Sites, including dumps, households, camps, communities and cities, and cemeteries

b. Cyanide Era
   1) Extraction and Processing Sites, including hard rock mining
   2) Transportation Sites, including railroad, inter-urban line and stage
   3) Timber Sites, including sawmills and lumber camps
   4) Water Management Sites
   5) Limestone, Lime and Flux Mining and Preparation Sites
   6) Settlement Sites, including dumps, households, camps, communities and cities, and cemeteries

c. 1930-1945 Era
   1)-6) as above

2. Associated with the lives of persons significant. Sites associated with people who are recognized as designers of important or regionally adapted mining technology; persons who are famous for their contribution to South Dakota mining history; people who are famous as substantial property owners; or people who are recognized as union or non-union labor organizers are considered eligible.

Note: If a site contains structures, which were designed by a renowned engineer/designer and which are sufficiently intact to exhibit the design and functioning of the structure, then the site should be considered under #3, "the work of a master" rather than under #2 "significant persons."

3. Embody distinctive characteristics of a type, period, or method of construction. Sites which have significant engineering structures, buildings, features, and/or artifactual remains, which help to interpret the various engineering technologies of mining and which retain sufficient integrity to allow for interpretation are considered eligible. The significant technologies are:

a. Mining
    1) Exploration by hand or mechanical means
    2) Placer mining
    3) Hard-rock mining, underground or open pit
    4) Hydraulic mining
b. Milling and Other Extraction
    1) Crushing and stamping
    2) Amalgamation
    3) Bromine and chlorination
    4) Smelting
    5) Cyanide
    6) Roasting
    7) Heap Leaching
c. Sawmill Industry
d. Lime and flux extraction and preparation

4. Potential to yield information in prehistory or history (archaeology). This criteria is subsumed under 1-3 above.